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SECTORAL WORKING PAPERS

During the course of work on major sectoral studies by UNIDO's Division for Industrial Studies, several working papers are produced by the Secretariat and by outside experts. Selected papers that are believed to be of interest to a wider audience are presented as Sectoral Working Papers. These papers are more exploratory and tentative than the sectoral studies. They are therefore subject to revision and modifications before incorporation into the sectoral studies.

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This paper was prepared for UNIDO by ILO, as a contribution to the First World-wide Study on the Wood and Wood Processing Industries.

Preface

The wood and wood processing industry has a particularly important role to play in the industrialization process of many developing countries. The importance of the sector for the developing countries has been reflected in the decision of the Industrial Development Board of UNIDO to organize the first Global Consultation on the sector which was held in Helsinki in September, 1983.

In connection with the preparation of the First World-wide Study of the Wood and Wood Processing Industries by UNIDO's Industrial Studies Division, UNIDO asked the secretariat of the International Labor Organization to prepare a paper on the health and safety aspects of the sector. The main results of the ILO contribution are summarized in the World-wide Study. This document presents ILO's analysis in its entirety. The views presented are those of the ILO secretariat.

UNIDO expresses its appreciation for this contribution to the First World-Wide Study of the Wood and Wood Processing Industries from the International Labor Organization.

* * *

The following UNIDO documents have been prepared in the context of the world-wide study:

1. First World-Wide Study of Wood and Wood Processing Industries, prepared by the UNIDO secretariat, UNIDO/IS.398.

2. Wood Resources and Their Use as Raw Material, prepared by the Food and Agriculture Organization of the United Nations, UNIDO/IS.399.

3. A Review of Technology and Technological Development in the Wood and Wood-processing Industry and its Implications for Developing Countries, prepared by J.F. Brotchie, UNIDO/IS.

4. Environmental Aspects of the Wood and Wood-processing Industry, prepared by K.M. Strzepek, UNIDO/IS.394.

5. Health and Safety Problems in Wood and Wood-processing Industries, prepared by the secretariat of ILO, UNIDO/IS.

6. Potentials and Requirements of Increasing the Degree of Wood Processing in Developing Countries of Asia and the Pacific, prepared by H.P. Brion, UNIDO/IS.395.

7. Tariff and Non-tariff Measures in World Trade of Wood and Wood Products, prepared by the secretariat of UNCTAD, UNIDO/IS.396.

8. The U.S.S.R. Forest and Woodworking Industries, prepared by N.A. Burdin, and V.A. Sylantyev, UNIDO/IS.406.

9. The Wood and Wood-processing Industry as a Consumer and Supplier of Energy, prepared by Swedforest Consulting AB, UNIDO/IS.

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INTRODUCTION

This paper deals primarily with sawmilling, the wood panel industries, carpentry, joinery and furniture making. Some reference is made to logging and, to a lesser extent, to pulp and paper making.

The first part of the paper contains a detailed analysis of statistical information on occupationa injuries and diseases in the wood and wood processing industries. Although this is largely based on data from industrialised countries, it provides a rather good insight into the problems with which developing countries are faced in this field.

In the second part of the paper a broad outline is given on how to deal with the major occupational safety and health problems in a practical way under conditions prevailing in developing countries.

1. Statistical information

1.1 General considerations

Up until now it has been extremely difficult to provide internationally comparable statistical data on occupational injuries because the methods of compiling, computing and analysing relevant data differ widely.

Many countries have their own system of industrial classification and injury reporting or follow, in rather broad terms the following international systems:

- United Nations International Classification of all Economic Activities (ISIC)

- Statistics of Industrial Injuries, ILO 1962.

In 1982 the 13th International Conference of Labour Statisticians adopted new guide-lines concerning statistics of occupational injuries as a basis for the analysis and measurement of risks, the establishment of prevention

programmes and the evaluation of the efficiency of measures taken. It recommended standard methodology, definitions and concepts for the classification and presentation of statistics as a means of achieving a higher degree of comparability at the national and international level.

These new recommendations should be considered particularly by those countries where reporting systems for occupational injuries and diseases have not yet been generally applied.

A difference is made between employment injuries resulting from work accidents and from commuting accidents. To the extent possible only the former will be considered in this report.

Table 1 provides an outline of terminology, classification and comparative measure of occupational injuries as recommended by the 13th International Conference of Labour Statisticians.

At present in international comparisons of occupational injury frequency and severity differences are to be expected because:

- Work accident reporting may not be complete or includes only serious accidents or only accidents with a certain minimum number of lost days, or even accidents without lost time.

- Work accidents and commuting accidents are sometimes not separated.

- Often the working time of workers exposed to risk is not exactly known.

- Data are not readily available on time lost through occupational injuries or different allowances are made for time lost in the event of permanent partial or total disability or death or time is counted differently (e.g. work days or calendar days, etc.).

Table 1: Statistics of occupational injuries

The following outline has been established on the basis of the resolution concerning statistics of occupational injuries adopted by the Thirteenth International Conference of Labour Statisticians, Geneva, 1982.

A. Terminology

1. Employment injuries arise from

   - work accidents
   - commuting accidents
   - occupational diseases

2. Occupational injuries include

   - death
   - injuries
   - diseases

3. Occupational injuries arise from

   - work accidents
   - occupational diseases

B. Classification

1. Total occupational injuries

   1.1 fatal (within one year)
   1.11 fatal (within 30 days)
   1.12 fatal (within 31-365 days)
   1.2 non-fatal (within one year)
   1.21 no lost time
   1.22 lost time (excluding day of accident)
   1.221 up to three days
   1.222 four and more days

2. Total days lost (for non-fatal injuries)

   2.1 lost time up to three days
   2.2 lost time four and more days

C. Comparative measures

1. Incidence rate

   denominator: average number of persons exposed to risk (e.g. 1,000)

2. Frequency rate (non-fatal)

   denominator: number of hours worked/paid (e.g. 1,000,000) or number of days worked

3. Days (shifts) lost

   3.1 average number of days lost per lost-time injury

   3.2 days lost per day worked by persons exposed to risk or days lost per person exposed to risk

Furthermore, wood and wood-processing industries may not be separated from other industries or be classified differently in different countries (e.g. carpentry and joinery may be included in construction industries).

1.2 Occupational injuries caused by work accidents

1.2.1 Incidence and frequency rates for non-fatal occupational injuries caused by work accidents

In Table 2 recent information has been compiled for a number of major countries on the incidence and frequency rates for occupational injuries in the wood and wood-processing industries as compared with the industrial average. For the reasons given above, the absolute values are not comparable between the different countries. However, the relative values (injury incidence/frequency of wood industries as percentage of all activities) clearly show that on the whole injury incidence/frequency rates in the wood industries are about two times higher than for all industrial activities. For the United Kingdom the figures are lower which may in part be due to the fact that the share of the more dangerous sawmilling is smaller than in other countries. This again shows how carefully international comparisons must be interpreted.

For some countries separate information is given on the injury incidence/frequency in logging and in pulp and paper making. As can be seen for logging the rates are higher and for pulp and paper making they are lower than in the wood industries. This can be explained by the relatively high risk of tree felling work in difficult terrain and by exposure to climatic inconveniencies in the first case and the high degree of mechanisation and automation in the second case.

Table 2: Incidence and frequency rates (I/FR) for non-fatal occupational injuries caused by work accidents

		(1) All activities	(2) Logging		(3) Wood industries		(4) Pulp and paper industries	
	Period	I/FR	I/FR	% of (1)	I/FR	% of (1)	I/FR	% of (1)
Canada[a/] (Quebec)	1979	7.88	35.32[i/]	448	20.68[ii/] 17.09[iii/]	262 217	9.74	123
Fed. Rep of Germany[b/]	1981	70			144	206		
Finland[c/]	1979	34.8	64.8[i/]	186	58.4[ii/]	168		
France [d/]	1980	34.9			54	166		
Philippines[e/]	1977-1981	13.02			40.73	313		
Sweden[f/]	1980	20.7	49.4	239	45.3	219	22.4	108
Switzerland[g/]	1977-1981	677	1720	254	1028	152		
United Kingdom[h/]	1979	3350			3130	93		
USA[j/]	1981	8.1	19.1	230	17.4[i/]	215	11.6	141

a/ Injuries with interruption of work per 100 workers
  i/ Forestry, logging and sawmilling
  ii/ Mechanical wood industry other than i/ and iii/, not including furniture industry
  iii/ Furniture industry
b/ Work accidents per 1,000 employees
c/ Accidents per 1,000 employees
  i/ including forestry
  ii/ including pulp and paper industries
d/ Accidents with interruption of work per 1,000,000 hours of work
e/ Injuries per 1,000,000 hours of work, based on sample of 5,200 injuries for all activities, of which 789 in wood industries.
f/ Occupational accidents per 1,000,000 hours of work
g/ Occupational accidents per 10,000,000 hours of work
h/ Number of accidents per 100,000 employees at risk
j/ Occupational injury incidence rates per 100 full-time workers
  i/ Including logging

1.2.2 Severity of occupational injuries caused by work accidents

In table 3 various measures of severity of occupational accidents have been included such as fatalities, accidents leading to permanent disability and the number of days lost through accidents related to exposure time or persons at risk.

It must be emphasized again that a comparison of the absolute values between different countries is hardly possible. However, within individual countries it is of interest to compare the ratio between the wood and wood-processing industries and the industrial average. As can be seen, accident severity as a rule is considerably higher in the wood and wood-processing industries than for the average of all activities. The impression gained from comparing incidence and frequency rates is thus confirmed for accident severity.

This corresponds also to the data given on logging and on pulp and paper making. Logging results in considerably higher rates of accident severity than wood processing, whereas in pulp and paper making accident severity is not so pronounced.

1.2.3 Trends in frequency and severity of occupational injuries caused by work accidents

For most industrialised countries frequency and severity rates of occupational injuries have been published over many years. From such data it is possible to obtain an idea of the impact of accident prevention measures, of changes in technology, of changes in the composition of the work force, etc.

A few examples of such statistics are given in table 4 which show that trends in frequency and severity of occupational injuries do not follow a uniform pattern. They are not easy to interpret if one is not familiar with prevailing conditions.

In Quebec, over the past decade, wood and furniture industries, in line with all activities, show a more or less steady increase in injury incidence.

Table 3: Severity of occupational accidents caused by work accidents

	Period	(1) All activities	(2) Logging	% of(1)	(3) Wood industries	% of (1)	(4) pulp and paper industries	% of (1)
Canada[a/] (Quebec)	1979	6.17	80.92[i/]	1311	14.65[ii/]	237	6.37	109
Fed.Rep.of Germany[b/]	1981	19.9			34.2	172		
France[c/]	1980	35.8			51.4	144		
Philippines[d/]	1977-1981	950.4			4.015	422		
Sarawak[e/]	1978	20	320	1600	40	200		
Sweden[f/]	1980	0.024	1.21	504	0.56	233	0.16	67
Switzerland[g/]	1977-1981	7.3	27.5	377	16.3	223		
Switzerland[h/]	1977-1981	1.0	4.4	440	0.6	60		
United Kingdom[j/]	1979	540			550	102		
USA[k/]	1981	60.4	288.1	477	156.9[i/]	260	102.3	169

a/ Number of fatal accidents per 100,000 persons employed
  i/ Forestry, logging and sawmilling
  ii/ Mechanical wood industry other than i/ and furniture industry.
b/ Number of accidents leading to permanent disability of 20 per cent and more for which compensation has been paid for the first time per 10,000 fully employed workers.
c/ Total of rates of permanent disability per 1,000,000 hours worked.
d/ Number of days lost per 1,000,000 hours of exposure.
e/ Number of fatal accidents per 100,000 persons employed.
f/ Number of fatal accidents per 10,000,000 work hours.
g/ Number of occupational accidents leading to invalidity per 10,000,000 work hours.
h/ Number of fatal accidents per 10,000,000 work hours.
j/ Number of serious accidents per 100,000 employees at risk, based on a 5 per cent sample of all accidents.
k/ Lost work days per 100 full-time workers
  i/ including logging.

Data recorded in the Federal Republic of Germany reaching back three decades reveal that the number of reported work accidents per 1000 fully employed persons increased during the first decade and subsequently remained practically unchanged for the wood industries, whereas there was a steady decline for the average of all activities. However, serious accidents and fatalities decreased significantly over the whole period for the wood industries as much as for all industries. Finally Swiss figures on accident frequency for two five-year periods are related to the decrease in weekly working hours. They indicate a proportionally higher decrease of accidents per 10,000 fully employed workers than for working time.

Generally speaking, it appears that in countries where the accident reporting system has been intensified during the period of observation there is an increase in the number of cases reported leading to higher incidence and frequency rates. On the other hand, if one looks at accident severity over a longer period of time as in the case of the data provided by the Federal Republic of Germany, it is obvious that continuing efforts of employers, employees and government authorities concerned resulted in considerable reductions. This clearly indicates the scope for the improvement of industrial safety in the wood industries of developing countries where such efforts, in most cases, have yet to be initiated.

1.2.4 Occupational injuries in different branches of the wood and wood-processing industries caused by work accidents

Criteria for the sub-division of wood and wood-processing industries differ so widely that international comparisons are practically impossible. Extracts of national statistics of three countries are given in table 5 which demonstrate, nevertheless, that the accident risks within the various branches of the industry are obviously not at the same level.

It appears that sawmilling as well as wood building and carpentry are the most hazardous, and furniture making the least hazardous branch of the wood and wood processing industries.

Table 4: Trends of frequency and severity of occupational injuries caused by work accidents

(a) Trends of injury incidence within the province of Quebec, Canada

Activity \ Year	Number of injuries caused by lost time work accidents per 100 workers						
	1973	1974	1975	1976	1977	1978	1979
Wood industry	14.93	17.33	16.02	14.57	14.87	17.98	20.68
Furniture industry	10.84	12.54	10.75	11.42	11.56	14.99	17.09
All activities	5.21	6.05	6.20	6.10	6.32	7.39	7.88

(b) Trends of work accident frequency and severity in the Federal Republic of Germany

Grouping of accidents	Activity	Year 1950	1960	1970	1980
Work accidents reported per 1000 fully employed workers	Wood industries	95	151	153	150
	All activities	80	127	103	76
Accidents leading to permanent disability of 20% and more per 10,000 fully employed workers	Wood industries	76.4	50.0	50.2	35.1
	All activities	41.1	32.2	26.3	19.8
Total number of fatalities	Wood industries	169	73	57	54
	All activities	3564	3021	2696	1807

(c) Trends of accident frequency in Switzerland

Activity	Average working hours per week			Accidents per 10,000 fully employed workers		
	(1) 1968/ 1972	(2) 1973/ 1977	(3) (2) in % of (1)	(4) 1968/ 1972	(5) 1973/ 1977	(6) (5) in % of (4)
Wood industries	46.8	45.9	98.1	2187	2065	94.4
All activities	46.1	45.3	98.3	1533	1362	88.8

Table 5: Occupational injuries in different branches of the wood and wood processing industries caused by work accidents

(a) Comparison of injury frequency within Forest Products Accident Prevention Association of Ontario, Canada (1982)

Activity	Reporting firms	Number of work hours in 1,000	Average work hour per firm in 1,000	Lost time injuries	Injury frequency per 1,000,000 work hours
Sawmilling	71	7118	100	242	34.0
Veneer and plywood manufacture	17	3313	231	60	18.1

(b) Occupational injuries of wood and wood-processing industries in Sweden (1980)

Activity	Number of establishments	Number of work hours in 1,000	Average number of work hours per establishment in 1,000	Number of accidents	Number of accidents per 1,000,000 work hours
Sawmills, planing mills, impregnation plants	1414	39456	28	2365	59.9
Wood material and building carpentry	2732	85094	31	4281	50.3
Particle board, plywood and parquet plants	67	6298	94	290	46.0
Prefabricated wooden houses, etc.	1251	39340	31	1626	41.3
Wooden furniture industry	461	8776	19	333	37.9

(c) Occupational injury incidence rate per 100 full-time workers in the United States (1981)

Activity	Lost workday cases	Lost workdays
Sawmills and planing mills	9.1	166.6
Millwork, plywood and structural members	7.6	125.3
Wood containers	8.4	132.1
Wood buildings, mobile homes	11.3	155.8
Wood preservation	7.8	140.7
Particle board	5.8	97.6

In order to draw up an efficient accident prevention programme it is most helpful if statistical data can be compiled and analysed according to clearly defined industrial branches such as:

- sawmilling
- carpentry and joinery
- wood panel manufacture
- furniture and cabinet making.

1.2.5 Detailed classification of occupational injuries caused by work accidents

It is desirable, preferably within the different branches of the industry, to classify occupational injuries according to the principal factors involved with a view to the identification of the most important hazards on which preventive measures must concentrate. Electronic data processing makes it possible to go into considerable detail and to easily establish cross references. Sampling may help to reduce the volume of information treated whilst improving its quality.

In table 6a, broad groups of classifying accidents in the timber and furniture industries of the United Kingdom are given. About one quarter of the accidents are primarily related to "handling goods" and another quarter to "falls", "stepping or striking against" and "struck by falling objects". Good housekeeping and smooth work flow is of the greatest importance to reduce these hazards.

Wood-working machines and vehicles are the main factor in about one third of the accidents as compared to only 5.1 per cent for hand tools. Table 6b shows the type of woodworking machines which cause accidents most frequently. Circular saws, planing machines and hand saw machines are the source of almost two thirds of the accidents reported on woodworking machines. If one excludes the accidents where the machines have not been specified, the proportion of these three machines rises to 84 per cent. This is a clear indication of an area on which safety measures must concentrate.

Table 6: Detailed accident classification United Kingdom, 1977

(a) Classification of accidents in the timber, furniture, etc. industries

	Total number	%
Handling goods	1785	28.4
Machinery	1652	26.3
Falls of persons	679	10.8
Vehicles (non-rail)	499	7.9
Stepping on or striking against	442	7.0
Struck by falling objects	428	6.8
Use of hand tools	319	5.1
Not specified	483	7.7
Total	6287	100

(b) Accidents reported at woodworking machines in all industrial premises

	Total number	%
Circular saws	736	33.7
Planing machines	411	18.8
Band saw machines	296	13.6
Verticle spindle machines	98	4.5
Multi-cutter moulding machines	45	2.1
Boring machines	40	1.9
Chain saws	26	1.2
Tenoning machines	22	1.0
Mortising machines	17	0.8
Lathes	13	0.6
Grooving machines	12	0.5
Not specified (470) and others (1)	471	21.3

Table 7 provides details on work accidents in the wood industries of the Federal Republic of Germany. Because of a different system of classification, these figures are not quite comparable with the ones discussed above.

In the Federal Republic of Germany industrial and artisanal processing share about a quarter of the work accidents each, a third quarter being classified under transport which thus constitutes another principal source of accidents (table 7a).

Among the principal agents of accidents, woodworking machines amount to about one third and vehicles as well as hand tools, scaffolding and joining elements to almost one fifth each (table 7b).

As in the United Kingdom, the list of machine types involved in accidents is headed by circular saws in almost one third of the cases, but the further order is somewhat different which may in part be explained by different groupings (table 7c). In table 7d the results of an interesting study are summarised in which accident frequency and compensation was related to the hours of operation of different machine types. Within this context, surface planing machines are most frequently involved in accidents, followed by different types of circular saws, but compensation costs were highest by roller-type coating machines, followed by pendulum circular saws.

Although much attention needs to be focused on occupational injuries caused by woodworking machines, one should not overlook the fact that a large part of the serious injuries is related to other sources of accidents, as can be seen from table 7e, providing data on 192 fatalities. Falls at lower level and falling objects are the cause of approximately 50 per cent of all fatalities. Fork lift trucks are as frequent in causing fatalities as other means of transport and these two groups each are only slightly exceeded by woodworking machines. Fire and explosion, suffocation in silos and electricity are also more frequently provoking serious accidents whereas they play only a minor role in respect of overall accident frequency as will be seen below.

Table 7: Detailed classification of work accidents in the wood industries, Federal Republic of Germany

(a) Distribution of accidents according to working area, 1981

Transport	Industrial processing	Artisanal processing	Construction site, scaffolding	Primary transformation	Others
26.4%	25.5%	24.9%	10.7%	7.4%	5.1%

(b) Distribution of accidents according to principal agent involved, 1981

Woodworking machines	Vehicles, transport installations	Raw materials	Hand tools, scaffolding, joining elements	Lifting and stacking implements	Others
31.5%	18.8%	18.7%	18.7%	7.7%	4.6%

(c) Distribution of accidents caused by woodworking machines and fork-lift trucks, 1981

Circular saws	Moulding machines	Planing machines	Turning and boring machines	Sanding machines	Band saw machines	Edge bonding machines	Fork lift trucks	Chipping, splitting, peeling machines	Veneer and plywood machines
36.5%	12.9%	12.7%	10.8%	9.6%	4.7%	3.1%	4.5%	2.9%	2.3%

(d) Results of a study on number of accidents and accident compensation per 1,000,000 hours of machine operation, 1977

Machine type	Number of reported accidents per 1,000,000 hours of operation	Accident compensation per 1,000,000 hours of operation US$
Surface planing machines	56.0	9.80
Multi-blade circular saws	39.3	11.08
Circular bench saws	38.2	15.04
Pendulum circular saws	30.4	30.44
Routing machines	24.6	10.96
Band sawing machines	19.5	5.56
Multi-side moulding machines	15.2	5.24
Verticle frame sawing machine	14.5	9.80
Roller-type coating machines	13.5	49.12
Edging circular sawing machines	13.2	14.48

(e) Causes of fatal work accidents in the woodworking industries, 1975-1981

Cause	Number	%
Falls at lower level	61	31.8
Falling objects	41	21.3
Woodworking machines	19	10.0
Fork lift trucks	17	8.9
Other means of transport	17	8.9
Fire, explosion	12	6.2
Suffocation in silos	8	4.1
Electricity	6	3.1
Others	11	5.7
Total	192	100

Table 8 gives an example of the combination between main event and principal agency in occupational accidents in Swedish sawmills. In this table one can check, for instance, where falls occur most frequently (162 out of 354 cases in relation to structural parts of houses, vehicles, interiors and scaffolding) or where over-exertion is concentrated (110 out of 204 cases in handling of materials, etc). Combined classifications of this and other types are an invaluable aid for the establishment of accident prevention programmes.

Table 8 also shows that the total numbers of accidents caused by electricity, fire, explosion or contact with chemicals and exposure to cold or heat amount to only 2 per cent.

Thanks to sampling techniques the Philippines have been able to provide rather detailed and up-to-date information on occupational injuries in the wood products industries which offer an interesting example for other developing countries. The procedures used follow largely the American Standard Method of Recording Basic Facts Relating to the Nature and Occurence of Work Accidents. Some of the data compiled have been condensed in tables 9 and 10.

In about one third of the cases the agencies causing the injury (table 9a) are machines and vehicles, followed by hand tools in a little less than 10 per cent of the cases. From the machine types listed (veneer clippers, glue spreaders, dryers) it can be concluded that veneer and plywood plants occupy a prominent place among the industries covered (15 enterprises with an average of 1,392 employees).

In tables 9b and 9c the occupational injuries are classified in respect of unsafe mechanical or physical condition and unsafe acts as a direct pointer for rectifying measures. It is significant to note that only 30 per cent of all reported injuries were free from unsafe mechanical and physical conditions and only 15 per cent were free from unsafe acts. This clearly shows that there must be a large margin for improvements.

Table 8: Main event and principal agency in occupational accidents in sawmills, Sweden, 1981

Main event	Principal agency											
	Hand-held machines, instruments or equipment	Elevator, lifting apparatus, conveyor	Vehicles	Woodworking machines, not hand-held	Other machines, machine parts, devices	Electrical equipment	Boilers, pumps, furnaces, piping, containers	Structural parts of houses, vehicles, interiors, scaffolding, etc.	Materials, construction units, packing, etc.	Chemical, physical, biological factors, persons	Others	Total
Electrical accident	-	-	-	-	-	1	-	-	-	-	-	1
Fire, explosion, blast	1	-	-	-	-	1	-	1	3	-	-	6
Contact with chemicals	-	-	-	-	-	-	-	-	-	3	7	10
Contact with cold or heat	10	-	-	-	-	1	4	-	5	1	2	23
Fall of person	9	20	33	7	2	-	-	162	105	3	13	354
Step on uneven surface, misstep, step on nail	-	1	1	-	-	-	-	79	21	1	2	105
Blow, press, cutting, etc. against stationary object	6	18	10	45	2	3	5	43	60	2	15	208
Struck by flying or falling object	37	41	9	55	11	1	2	32	85	7	45	325
Other contact with object, machine etc. in motion	44	96	28	219	10	-	2	34	35	15	4	487
Over-exertion of body	10	2	8	1	-	-	3	8	110	-	62	204
Pressing, cutting, etc. by hand-held object, etc.	62	16	6	27	5	1	2	14	110	2	1	246
Others	2	4	2	2	2	-	-	12	32	4	35	95
Total	181	195	84	354	32	8	18	350	553	38	178	1991

Table 9: Detailed classification of work injuries in the wood products industry, Philippines, 1981

Reporting establishments: 15, number of workers involved: 19,788, employee-hours worked: 47,491,200, number of disabling injuries: 799 (including 7 fatalities).

(a) Agency of injury		Number	%
Trees, logs, lumber		190	23.8
Machines: saws	39		
veneer clippers	36		
glue spreaders	10		
dryers	9		
others	80		
Total		174	21.8
Hand tools		70	8.7
Vehicles		59	7.4
Nails		50	6.2
Conveyors		39	4.9
Hoisting apparatus		25	3.1
Working surfaces		17	2.1
Chemicals		12	1.5
Dust		6	0.8
Hot substances		6	0.8
Others or not classifiable		151	18.9
Total		799	100

(b) Unsafe mechanical or physical condition leading to injury		Number	%
Improperly guarded agencies			
inadequately guarded	124		
unguarded	119		
Total		243	30.4
Hazardous arrangement			
unsafe processes	95		
unsafely stored tools, materials, etc.	46		
others	7		
Total		148	18.5
Defects of agencies			
sharp-edged	33		
slippery	21		
decaged, aged, worn	15		
others	44		
Total		113	14.2
Other unsafe mechanical or physical condition		48	6.0
No unsafe mechanical and physical condition		240	30.0
Not classifiable		7	0.9
Total		799	100

(c) Unsafe act leading to injury	Number	%
Using unsafe equipment, hands instead of equipment or using equipment unsafely	289	36.2
Unsafe loading, placing, mixing, combining	86	10.8
Failing to use safe attire (goggles, gloves, masks, shoes, etc.)	64	8.0
Taking unsafe position or posture	60	7.5
Operating without authority, failure to secure or warn	37	4.6
Operating or working at unsafe speed	22	2.8
Other unsafe acts	115	14.4
No unsafe acts	120	15.0
Not classifiable	6	0.7
Total	799	100

Table 10 includes information on the nature of injuries and parts of the body, compiled from the Philippine statistics on the wood products industry. The predominant features are open wounds on fingers and hands, feet and head which probably indicate that there is a great need to improve the use of personal protective equipment and proper work clothing.

1.3 Occupational diseases

A distinction is made between occupational injuries resulting from work accidents and occupational diseases. However, a formal international definition of occupational diseases does not exist because there are sometimes borderline cases between the two groups and, furthermore, national distinctions are based on different regulations for insurance and compensation.

Whereas the accident is the result of a sudden and unforeseen event occurring at a definite point in time, the occupational disease is the result of repeated or continuous action caused by exposure to environmental factors associated with employment which become apparent after a certain period of time.

In 1925 the ILO established, for the first time, a list of occupational diseases within its Convention No 18 concerning Workmen's Compensation for Occupational Diseases, which was subsequently revised in 1934 and 1964 and amended in 1980. The latest version of this list comprises 24 different occupational diseases. National legislation has been guided by this standard. Some industrialised countries exceed it but very few of the developing countries have been able to meet the requirements of this standard.

During the past decade the knowledge of occupational diseases in the wood industries has been largely increased through medical research. This is reflected, among other things, in ILO's CIS abstracts issued during the period from 1973 to 1983. Of approximately 200 abstracts dealing with occupational safety and health problems in the wood industries about half concern occupational diseases. Compared with injuries from work accidents, occupational diseases occur much less frequently but they are usually more serious as can be seen from the extracts of statistical information discussed below which originates exclusively from industrialised countries.

Table 10: Distribution of work injuries, according to nature of injury and part of body, in the wood products industries, Philippines, 1981

NATURE OF INJURY	%	NO.	PARTS OF THE BODY										
			Eyes	Head	Back	Trunk	Arms	Hands	Fingers	Legs	Feet	Toes	Not classifiable
ALL INJURIES		789	33	102	19	27	54	66	267	47	114	44	16
(percent)	100.0		4.2	12.9	2.4	3.4	6.8	8.4	33.8	6.0	14.5	5.6	2.0
Lacerations	52.4	414		68		3	18	44	164	25	74	14	4
Bruises, hematoma	29.4	232		29	6	13	20	15	72	16	32	20	9
Strains, sprains	5.2	41		1	9	5	9	2	5	2	5	2	1
Burns	2.4	19		1	1	2	5	3	2	3	2		
Crushing injuries	3.3	26		2		1			14	1		8	
Fractures	1.8	14			3	1	2	1	5		1		1
Industrial diseases	1.3	10	9										1
Amputation	0.4	3							3				
Electric shock	0.1	1		1									
Not classifiable	3.7	29	24			2		1	2				

Corresponding data concerning the wood industries of developing countries have not yet become available.

In table 11 data on work accidents and occupational diseases in Canada (Quebec) are compared between the wood and furniture industries and all activities. The total number of occupational diseases corresponds to only 2.1 of the total number of work accidents for all activities and to 1.1 per cent of the total number of work accidents in the wood and furniture industries. The frequency of occupational diseases thus appears less pronounced in the wood and furniture industries than on the average of all activities. The principal occupational diseases were hearing impairment caused by noise, dermatosis, musculoskeletal diseases, poisoning and respiratory allergies. Hearing impairment and respiratory allergies occured proportionally more frequently in the wood and furniture industries than for the average of all activities.

In table 12 information on occupational diseases in the wood industries of the Federal Republic of Germany has been compiled. The overall situation ressembles that of Canada (Quebec) discussed above. Occupational diseases account for 1.1 per cent if compared with the number of work accidents and are less frequent than for the average of all activities. Furthermore, it can be seen that in the wood industries the proportion of the more serious cases leading to permanent incapacity for work of 20 per cent and more amounts to 4.3 per cent of the occupational diseases (table 12a). Another interesting feature is the trend of frequency of occupational diseases between 1950 and 1980, which shows a considerable reduction for all activities vis-à-vis a steep increase in the wood industries (table 12b).

The principal occupational diseases in the wood industries of the Federal Republic of Germany are shown in table 13 which reveals that hearing impairment ranks first, followed by skin diseases, occupational asthma and inflamation of tendons of the hand. The steep increase in occupational diseases in the wood industries over the past decade was mainly due to hearing impairment caused by noise.

Table 11 Comparison of reported work accidents and occupational diseases, Canada (Quebec) 1978

	Wood industry	Furniture industry	Total of wood and furniture industries	All activites
1) Total number of work accidents	8,777	4,086	12,863	299,085
2) Total number of occupational diseases	105	36	141	6,127
3) 2) in % of 1)			1.1	2.1
4) Heavy impairment caused by noise	51	10	61	1,691
5) 4) in % of 2)			43.3	27.2
6) Dermatosis	20	8	28	1,170
7) 6) in % of 2)			19.9	18.8
8) Musculoskeletal diseases	9	8	17	632
9) 8) in % of 2)			12.1	10.2
10) Poisoning	10	3	13	840
11) 10) in % of 2)			9.2	13.5
12) Respiratory	5	0	5	44
13) 12) in % of 2)			3.5	0.7
14) Others	10	7	17	1,840
15) 12) in % of 2)			12.0	29.6

Table 12 Occupational diseases in the wood industries, Federal Republic of Germany

a) Comparison of work accidents and occupational diseases between all activities and wood industries, 1980.

	1) All activities	2) Wood industries
1) Total number of reported work accidents	1 541 214	79 022
2) Total number of reported occupational diseases	45 114	865
3) 2) in % of 1)	2.9	1.1
4) Total number of work accidents leading to permanent incapacity of 20% or more which have been compensated for the first time	40 051	1 847
5) 4) in % of 1)	2.6	4.3
6) Total number of work accidents leading to permanent incapacity of 20% or more which have been compensated for the first time	5 613	80
7) 6) in % of 2)	12.4	9.2

b) Comparison of trend of frequency of occupational diseases between all activities and wood industries, 1950 - 1980.

	Number of occupational diseases per 1 000 fully employed persons leading to permanent incapacity of 20% or more which have been compensated for the first time			
	1950	1960	1970	1980
All activities	8.7	4.2	2.3	2.8
Wood industries	0.2	0.3	0.6	1.5

Table 12 Continued

c) Principal occupational diseases in the wood industries, Federal Republic of Germany, 1981

	Reported cases		Cases leading to permanent incapacity of 20% and more which have been compensated for the first time	
	number	%	number	%
Hearing impairment, caused by noise	682	62.8	86	78.2
Skin diseases	207	19.1	13	11.8
Occupational asthma	81	7.5	8	7.3
Inflammation of tendons of hand	39	3.6	0	0
Others	76	7.0	3	2.7
Total	1085	100	110	100

In Switzerland, during the period from 1973 to 1977, of the total of work accidents and occupational diseases the latter account for 1.7 per cent of the reported cases, for 2.8 per cent of the cases leading to permanent incapcity and for 6.4 per cent of the total of compensation paid. When comparing the number of cases of occupational diseases for 10 000 insured persons for the two five-year periods 1968/72 and 1973/77 for all activities, the figure went down from 27.2 to 22.5 whereas for the wood industries it rose from 11.1 to 13.5 per cent. This trend is similar to that of the Federal Republic of Germany although less pronounced.

In the United Kingdom during the period from 1974 to 1979, 1 102 cases of occupational diseases were reported in the wood and furniture industries of which 559 were classified under non infective dermatitis, 422 under inflammation of tendons of hand, 97 under beat hand, beat knee or beat elbow and 24 under other prescribed diseases. This is a somewhat different distribution than in Canada (Quebec) and the Federal Republic of Germany to be explained mainly as a result of different regulations for reporting occupational diseases.

The same can be said of French national statistics which distinguish not less than 70 different causes of recognised occupational diseases and which provide an example of the variety of health hazards in the wood industries caused particularly by toxic substances.

The most frequent cause of occupational disease in the French wood industries is toxic wood in 19 out of 83 cases. However, toxic wood caused an additional 33 cases of occupational diseases in other industries, of which 32 in the building industry (which incidentally shows that carpentry and joinery are classified there). Looking back over the last decade the total number of cases of occupational diseases caused by toxic wood developed as follows: 1971 - 26, 1972 - 30, 1973 - 39, 1974 - 42, 1975 - 39, 1976 - 32, 1977 - 38, 1978 - 50, 1979 - 45, 1980 - 52. This gradual increase possibly reflects among other things, a greater awareness of the dangers of toxic woods and increasing medical expertise in its diagnosis as a cause of an occupational disease.

From the discussion of statistical findings, it can be concluded that in the industrialised countries occupational diseases in the wood industries are of growing concern. Glues, paints and chemicals used for wood preservation have been for many years and continue to be a major hazard. During the past decade dust of toxic wood and noise leading to occupational diseases have made an additional impact. Most of these problems have not yet become apparent in developing countries where, up until now, the resources available are concentrated on improving the general health situation and where the long-term exposure of workers to a harmful working environment is less frequent. This should, however, not be a reason for overlooking the need for preventive measures especially with regards to newly created larger sized industrial establishments, offering great numbers of permanent jobs.

2. Practical problems and solutions

2.1 Safety problems

In the industrialised countries a large number of different machines are used for sawmilling, manufacture of wood panels, carpentry and joinery and for furniture making. Technology is rapidly advancing, requiring continuous efforts to keep in line with safety requirements. In the developing countries the same advanced technology is applied in large-scale enterprises such as the wood panel industry. However, in sawmilling a considerable number of simple small mills equipped with circular saws, band saws and even pit saws exist side by side with sophisticated modern mills. The bulk of furniture is still made by artisans working with a few basic hand tools. The complexity of this situation does not permit a detailed discussion of safety problems in the context of this paper. For this reason, the emphasis will be put on some selected common areas where safety problems are particularly important.

2.1.1 Plant layout, materials handling and housekeeping

As can be seen from the statistics, a large proportion of accidents are caused by "falls", "stepping or striking against", "struck by falling objects" and "handling goods". Among the different work phases transport is particularly accident prone.

Table 13 Occupational diseases in the wood industries, France, 1980

Type of occupational disease	Number of cases
Diseases caused by toxic wood	19
Health damage due to organic isocyanats	13
Skin diseases due to epoxy resins	9
Ulcers caused by formaldehyde and its polymers	7
Lead poisoning	6
Benzene intoxication	5
Intoxication due to ethylene chlorinated derivatives	5
Contact dermatitis	4
Asbestos-related diseases	3
Intoxication by pentachlorphenol	2
Hearing impairment caused by noise	2
Ulcers caused by chromic acid	1
Health damage due to aromatic amines	1
Silicosis	1
Skin diseases due to lubricants	1
Health damade due to nickle oxydes and salts	1
Beat knee	1
Intoxication due to hexane	1
Occupational asthma	1
Total	83

To keep hazards in materials transport and handling under control requires, more than anything else, a proper layout of work and storage places, a well-designed succession of work operations and work flow and the maintenance of an adequate standard of order and cleanliness. Where such conditions exist there will not only be low rates of accidents but also a high level of productivity.

Materials transport and handling tends to be a problem, especially when smaller enterprises are gradually expanding and when space is limited. It is most important to ensure that there is enough space for workers and for vehicles to move freely. This may call for opting for a new working site rather than continuing under hazardous conditions on the old one.

Flooring should be even, non-slippery and free from obstacles. Offcuts, shavings and sawdust must be cleared away regularly. Ladders, stairways, railings and working platforms must be kept in adequate condition to avoid falls to a lower level which may result in severe injuries.

Where plant layout is insufficient it is often possible, through simple adjustments, to remove safety hazards. Good housekeeping requires little extra time but will save a lot of unproductive delays. To comply with such basic safety demands few, if any, special investments are necessary. However, managers and supervisors must be safety-concious and play an active role in the instruction and motivation of workers. A large number of accidents, including fatalities, can thus be avoided.

When establishing new wood-industries, especially larger industrial complexes, plant lay-out should be carefully studied and adapted to local conditions and requirements instead of relying blindly on standard blue-prints for key-turn factories.

No matter whether working in a small or big woodworking plant a considerable amount of time and effort is spent on moving and storing bulky and heavy material. Unloading, sorting and storage of logs, handling of sawn wood, of finished products or of waste requires just as much care and proper equipment when done manually or mechanically. Unless tools, equipment and machines for transport such as turning hooks, levers, simple carts, lorries,

forklift trucks, cranes, chain conveyers and rail systems are not in adequate condition and handled skilfully a great deal of trouble can be expected as regards both maintaining reasonable standards of productivity and safety.

2.1.2 Woodworking machines

General considerations

Woodworking machines generally speaking are one of the most dangerous type of machines used in industry. Accident statistics from different industrialized countries show quite clearly that inspite of the increasing variety of special machines the majority of injuries caused by woodworking machines concerns a few basic machines, namely circular saws, planers and spindle moulders. To this may be added, especially under conditions of developing countries, band saws and chain saws.

All machines must be provided with adequate guarding of moving or projecting parts. According to ILO Convention No 119 and Recommendation No 118 on the Guarding of Machinery the manufacturer, vendor or the person letting out a machine on hire shall ensure that dangerous parts of machines are fitted with appropriate guards, the employer shall make sure that machines are used in that condition and workers shall not be permitted to operate machines which are not properly guarded. Futhermore measures shall be taken to enforce these provisions.

In the case of developing countries care must be taken that machines supplied from industrialized countries are equipped with guards accoring to the safety standards of the country of origin. Tenders for new machines should specify that dangerous machine parts must be adequately guarded. Several developing countries are themselves manufacturing woodworking machines. They must make sure that safety requirements are fully considered already at the design stage and that new machines are tested in respect of safety by a competent authority before being released for commercial production.

Machine guarding is of the greatest importance in relation to saws and cutter heads which additionally must always be kept sharp, must be firmly fixed and must run at the prescribed speed.

Circular saws

When working with circular saws accidents are frequently caused due to contact between the hand and the saw and because of kick-back of wood resulting in bruises, scratches, penetration of splinters, cuts and amputations. The operation of circular saws without proper guarding inevitably leads, in the course of time, to serious accidents.

Circular saws used for rip sawing (length sawing) must be fitted with adjustable hood guards covering as much as possible of the saw blade above the table and additional guards covering the saw blade below the table to prevent accidental touching of the saw. To avoid kick-back circular saws must furthermore be fitted with adjustable riving knives the height and thickness of which as well as their distance from the saw blade must correspond to narrowly defined limits. The guide fence must be parallel with the saw blade. Jamming of wood between the saw blade and the guide fence can be prevented by an adjustable intermediate guide fence. A further means of protection are push sticks. Correctly applying all these protective implements obviously requires a skilled and adequately instructed operator.

A large variety of circular saws are used for cross-cutting. Pendulum saws mounted above the saw bench are the most common type. They must be equipped with a self-adjusting guard covering the saw blade, a counterweight that returns the saw after cross-cutting to a safe position behind the guide fence, a device limiting the travel of the saw beyond the saw bench and a start and stop switch within easy reach of the operator. The saw should be operated from the side.

Band saws

Bench-type band saws are commonly used by cabinet makers. In some developing countries they are also employed for breaking down small size and short logs. Such saws require complete guarding of the upper and lower band wheel. Additionally an adjustable top guide is needed which can be lowered to the height of the timber to be cut. A brake should be available to stop the saw blade after switching off power. Saw blades must frequently be checked for defects such as cracks or inadequate joints.

Chain saws

Different types of chain saws are available for cutting wood. The most widely spread ones are petrol-driven portable chain saws operated by one man. Although primarily used in logging they are also frequently employed in wood industries as a helping tool for instance for cross-cutting trees on log yards. In 1978 the ILO published a Code of Practice on Safe design and use of chain saws which specifics the essential safety requirements for such machines. These include a front handle guard with chain brake to protect the hand and stop the chain during kick-back, a chain catcher to catch the chain if it breaks, a rear handle guard, a throttle control lock out to prevent the saw chain from starting to move unexpectedly, anti-vibration devices and a guide bar cover. Chain saws should not be used unless they fullfil these requirements.

Planers

Among the different planing machines hand-fed surface planers are the most dangerous and probably the most widely used ones in developing countries. They should be fitted with securely fixed cylindrical cutters. To prevent contact with the hand the cutter block must be guarded by an adjustable bridge-type guard. Various designs are in use. Particularly handy are telescopic guides which provide protection on both sides of the fence guide.

Thicknessers have the advantage that the cutter block can be completely enclosed which also facilitates collection of dust and shavings. Wood passes below the cutter block and is fed by powered rollers, which should be released automatically in the case of jam. As a protection against kick-back a sectionalized system of rollers or teeth should reach over the whole in-feed side.

Spindle moulders

Spindle moulders are used to shape wood edges according to many different patterns of design. Special care is required to avoid contact with the high speed working tool particularly under conditions which do not allow to guard the cutter completely.

The cutter should be surrounded by an enclosure which should preferably be combined with an exhaust ventilation system for wood dust, chips and shavings. If the wood is passed along a straight fence guide mechanical devices should be fitted to hold it down on the table and against the blader while at the same time providing protection against kick-back. Jigs shall be employed when the use of such hold-down devices is not applicable as in the case of irregularly shaped work pieces. Jigs may also serve as a template for the finished product. After cutting off power spindle moulders should be stopped by a brake.

Other wood-working machines

There exist many further types of wood working machines than the ones dealt with which are needed for sawing, debarking, splitting, chipping, steaming, drying, boring, turning, bending, bonding, pressing, sanding, coating, nailing etc. Detailed safety instructions and regulations have been issued by manufacturers and competent national authorities in technologically advanced countries on the installation and operation of such machines which should under all circumstances the observed when introducing them in developing countries.

However, the greatest impact on improving the prevailing safety situation will doubtlessly be made when ensuring that the more widely used basic machines correspond as closely as possible to the safety requirements which have been discussed above.

2.1.3 Other safety problems

Fire

In all wood and wood-processing industries fire is an ever-prevailing potential danger when wood waste is accumulating and when large quantitities of wood materials and products are stored. Fire not only endagers human lives but also destroys industrial premises and may deprive workers of their job for long periods of time. More than most other industries the wood and wood-processing industries must therefore be concerned about minimising the fire risk and being well prepared to efficiently suppress fire outbreaks.

The smaller the wood particles are the higher the fire risk. Wood dust, shavings and chips are particularly hazardous materials. If wood dust accumulates on engines and impaires their cooling system, there may be a fire risk due to overheating. Furthermore, sawdust, shavings, etc. tend to self-ignite due to internal heating. Regular disposal of wood waste is, for these reasons, of crucial importance as are precautions and restrictions concerning the use of open fire, welding equipment, smoking, handling of highly inflammable chemicals, etc.

Fire fighting equipment must be kept ready for use in convenient places and workers should know how to handle it in case of fire alarm. Periodic checks of equipment, responsibilities of employees in fire fighting and co-operation with outside fire brigades must be clearly settled. Small work shops may just keep sand and water in accessible places, whereas larger ones may require motor pumps, chemical fire extinguishers and a specially trained internal fire fighting crew.

Electrical shock

Faulty electrical equipment may provoke electrical shock of workers, fires or explosions, all of which have severe consequences for the worker and the enterprise.

Electrically powered woodworking machines must therefore comply with prevailing national standards. Installation and repair must be done by qualified electricians. Wiring and cables should never be allowed to be worn.

Special attention is required in the case of portable electrical machines such as drills, saws and sanders. They must be properly earthed. Cables should be placed in safe places e.g. by means of putting them between two boards or suspending them over supports.

Repairs and maintenance

A considerable accident risk is involved in the repair and maintenance of machines if carried out by unqualified personnel and with unsuitable equipment. Knowledgeable operators, experienced mechanics and the

availability of proper tools are the best means of protection against such risks which tend to be under-estimated. Before maintaining a machine, dismantling it and taking off guards, the power must be locked off and the danger of setting the machine accidentally into motion is thus excluded.

A special problem consists of keeping saws and cutters sharp by means of machines equipped with grindstones. The hazards in this activity are caused by the handling of sharp tools, by filings flying off and by breaking grindstones. Screening of grindstones, the use of transport frames for circular saws and the application of personal protective equipment such as goggles, aprons and gloves are the most important precautions.

2.2 Occupational health problems

Having already dealt with occupational diseases in the wood and wood processing industries in the light of the available statistical evidence, in this chapter some condensed information is provided on the major occupational health hazards leading to occupational diseases.

As has been explained, occupational diseases in the woodworking industry are becoming better known because of the increasing interest of employers', and workers' organisations and of public authorities in the occupational health problems. More research is carried out on health risks due to the use of new chemicals for wood preservation and for surface finishing, and more epidemiological enquiries have put in evidence an increased exposure of woodworkers to certain diseases. Furthermore, resulting from the emission of high levels of noise and the production of large quantities of very fine wood dust, the occurance of health troubles has increased due to these physical causes.

2.2.1 Wood dust

Dust is produced in working with wood particularly in furniture and cabinet making. Dust in high concentrations may impair the workers' health and furthermore may provoke explosions and increase the risk of fires. A distinction must be made between inert wood dust and dust from toxic wood.

Dust of inert wood may give rise to local skin irritation, mainly due to mechanical action, depending on the size and the characteristics of wood particles. This skin irritation is generally situated in skin folds where the dust may collect or where dust stained clothes may irritate the skin. Inert wood dust may also contain free silica and represent, therefore, a risk of pneumoconiosis. For this reason the concentration of wood dust in the working environment should not exceed a given level.

Certain varieties of wood, mainly tropical, are likely to induce biological reactions of various kinds, in particular on the exposed skin and mucosae. The first symptoms are primary irritating effects, including skin symptoms in persons working with green wood; in this case the resulting dermatitis is due to the direct action of the wood on the skin; conjunctival irritation may follow, with inflammation, intense watering of the eyes (lacrymation) and occasionally reactions in the eye tissue (keratitis). Wood dust may be inhaled and cause irritation of the mucosae of the upper respiratory tract, sometimes with such symptoms as sweating, coughing or hoarseness. Allergic conditions may appear, such as skin disorders (dermatitis, eczema), and asthma. The skin lesions begin with irritation and eruptions on the skin of the hand and face, with severe itching. After a few days these eruptions may give way to the appearance of vesicules which crack and form crusts which often become infected. Repeated exposure may lead to a generalised allergic reaction, with lung symptoms such as feelings of bronchial constriction and asthma, sometimes associated with the skin conditions.

A particular health hazard is that of nasal cancer among cabinet makers. In the furniture industry, wood is sanded down using belt, disc or orbital sanders. These operations give rise to large quantities of extremely fine wood dust which may prove to be particularly irritant to the respiratory tract. Recent epidemiological enquiries have shown a prevalence of nasal cancer in cabinet makers, which has been attributed to the inhaled wood dust. The symptoms due to wood and wood dust are generally related to the different types of work as explained in table 14.

Table 14 Clinical symptoms of exposures to toxic wood and wood dust in different branches of the wood industries

Occupation	Clinical symptoms	Cause
Sawmills	Primary skin lesions, skin allergy, asthma	Residue of resin, sap and other constituents of wood
Wood panel industry	Skin allergy, conjunctivitis, irritation of mucosae of upper respiratory tract, general symptoms	Wood constituents in dust and waste water, resin vapours, tannins, alkaloids, quinones, terpenes, glycosides, saponins, etc
Furniture manufacturing, wood processing, carpentry, etc	Irritation of mucosae of upper respiratory tract, conjunctivitis, skin allergy, asthma, nasal cancer	Wood constituents, especially in wood dust, resins, tannins, alkaloids,

Regulations concerning exposure of workers to dust have been adopted in a number of countries. Table 15 contains threshold limit values which differ somewhat between individual countries, the most common value for long-term exposure being 5 mg/m^3. In British Columbia stricter standards have been established for allergenic workers (2.5 mg/m^3) than for non-allergenic workers (5 mg/m^3 for long-term exposure).In the Federal Republic of Germany wood dust is listed among the compounds which are justifiably suspected of having carcinogenic potential (Maximum Concentrations at the Workplace and Biological Tolerance Values for Working Materials, 1982).

To reduce the hazards involved in dust requires efficient systems of exhaust ventilation of woodworking machines and of dust collection. Especially in the smaller woodworking establishments of developing countries much more attention must be paid to this problem. Personal respiratory equipment is needed if adequate dust control cannot be achieved by ventilation. Furthermore, pre-employment and periodic medical examinations are important for workers exposed to dust.

Table 16 contains a list of the principal tree species with toxic wood. It must be noted that there are undoubtedly a large number of lesser known tropical trees which are also toxic. Attention should be paid to this potential hazard when introducing lesser-known woods on a larger scale in the national or international market.

2.2.2 Chemicals

A large number of harmful chemicals are used in wood preservation and processing. The ILO report on Occupational Safety, Health and Welfare in the Woodworking Industries, published in 1967, contains a detailed list of the nature of such chemicals, their application and their effect upon the worker's health. This list includes 48 chemicals used in timber treatment, 16 glues, 11 varnishes, 11 binders, 27 solvents and diluents and 31 additives. In 1977 the ILO published a tabular compilation of values of occupational exposure limits for airborne toxic substances from selected countries. Further relevant information is provided in the IARC monograph no 25 on the Evaluation of the carcinogenic risk of chemicals to humans in the wood, leather and associated industries, (Lyon 1981), which contains a list of chemicals used in wood and associated industries including an evaluation of carcinogenicity.

Table 15 Regulations concerning exposure to wood dust

Country	Threshold limit value (mg/m3)	Comments and reference
Finland	5	
Federal Republic of Germany	10	Fine, inert dust
German Democratic Republic	10	Domestic wood dust only (pine, oak, spruce, beech)
United Kingdom	5	
United States:		
Washington	5	
Oregon	10	Presently at 10 mg/m^3 moving towards 5 mg/m^3
California	5	Long-term exposure
	10	Short-term exposure
Canada		
British Columbia		Non-allergenic (Workers' Compensation Board, 1978)
	5	Long-term exposure
	10	Short-term exposure
	2.5	Allergenic (Workers' Compensation Board)
Alberta	5	All wood dust, long-term exposure
	10	All wood dust, short-term exposure
India	15	Total
USSR	2	More than 10% free silica (ILO 1974)
	4	Less than 10% free silica (ILO 1974)
Sweden	4	
Poland	10	Containing no free silica
Yugoslavia	10	Total, containing no free silica
Switzerland	20	Total
	8	Fine

Source: Evaluation of the carcinogenic risk of chemicals to humans in the wood, leather and some associated industries. IARC Monographs 25, Lyon 1981.

Table 16 Principal tree species with toxic wood

Botanical name	Common name	Symptoms (in brackets suspicion only)		
		Dermatitis	Mucosal irritation	General symptoms
Thuja standishii	Arbor vitae		X	
Distemonanthus benthamianus	Ayan	X		
Dalbergia melanoxylon	Blackwood African	X		
Gonioma kamassi	Boxwood, Knysna		X	X
Thuja plicata	Ceder, Western red	(X)	X	
Dalbergia retusa et spp.	Cocobolo	X		
Brya ebenus	Cocus	X		
Piptadeniastrum africanum	Dahoma		X	
Diospyros spp.	Ebony	X	X	
Guarea thompsonii et spp.	Guarea		X	
Tabebuia ipe et spp.	Ipe (lapacho)	X	X	X
Chlorophora excelsa	Iroko	X	(X)	
Sandoricum indicum	Katon		X	X
Khaya ivorensis et spp.	Mahogany, African	X	(X)	
Swietenia macrophylla et spp.	Mahogany, American	X		
Tieghemella heckelii	Makoré	X	X	
Mansonia altissima	Mansonia	(X)	X	X
Triplochiton scleroxylon	Obeche	(X)	X	
Nauclea trillesii	Opepe	X	X	
Aspidosperma peroba	Peroba rosa	X	X	X
Paratecoma peroba	Peroba white	X	X	
Gonystylus bancanus	Ramin	X		
Dalbergia spp. Machaerum spp.	Rosewoods	X		
Chloroxylon swietenia	Satinwood, Ceylon	X		
Fagara flava et spp.	Satinwood, West Indian and African	X		
Sequoia sempervirens	Sequoia		X	X
Dysoxylum muelleri	Stavewood		X	X
Tectona grandi	Teak	X		
Frullania, etc	Liverworts and lichens on bark	X		

Source: Woods, B. and Calnan, C.D., Toxic Woods, British Journal of Dermatology, 1976, 94 (supplement 13, pages 1 -97)

While reference is being made for detailed study to the above sources of information, some examples of occupational risks caused by those chemicals which are more commonly applied in the wood industries will be given below.

Wood may be attacked by a variety of moulds and insects and various treatments may be employed to prevent such attacks for which a large variety of chemicals are used. Among these there are: tar, creosote, mineral oil, copper, mercury and chromium salts, arsenicals, various chlorophenols and their metal salts, chlorinated naphtalenes (aldrin and dieldrin), chlorinated methane and ethane derivatives, nitrocompounds, organic mercury compounds, epoxy resins, etc. The application of these products may be made in different ways, according to the quality and the use of the wood and the depth to which the chemical will penetrate the wood, because the effectiveness of the protection will increase with the depth of the treatment. These substances may be applied by brushing or spraying, by immersion with or without previous steaming, by osmosis and by injection. The substances used for these treatments present a variety of health hazards ranging from skin irritations and irritation of mucosae of the eyes and of the bronchial tree, to allergic reaction and severe poisoning. Therefore, every attention should be payed to avoid contact with them. In practice, wood treatment is carried on at present, as far as possible, in enclosed systems, but effective ventilation and the wearing of protective clothing, rubber boots, face shields, gloves, etc. is recommended in order to avoid contamination in the way of leakage of vapours or mists, or spilling from defective enclosures. Risks of harmful exposures are obviously higher when treating timber, already used in the internal structure of buildings. Where recently treated wood is handled and put in operation there is a risk of inhalation of noxious dust and of skin contact with contaminated surfaces.

Veneering, plywood and particle board manufacturing has expanded considerably in recent years and so has the amount and variety of adhesives used in the bonding of wood panels. The two main groups of these are natural glues and artificial glues. Apart from casein glue, the natural glues are used less. The greatest use is made of synthetic adhesives such as those based on formaldehyde and the neoprene adhesives. Any of these synthetic glues may constitute a risk of skin disease or of systemic intoxication, in particular those which release free formaldehyde or organic solvents.

Formaldehyde can act through inhalation and transcutaneous absorption. Exposure to low atmospheric concentrations of formaldehyde causes irritations, especially on the eyes and the upper respiratory tract. When the concentration exceeds 4 - 5 ppm, the discomfort increases rapidly with the appearance of difficulty in breathing, burning of the eyes, nose and trachea, intense watering of eyes and severe spasmodic coughing. Inhalation of high concentrations may be fatal. Direct contact with solutions or resins containg formaldehyde may give rise to inflammatory dermatitis. Repeated exposures may lead to allergic reactions, with the appearance of chronic eczema.

Solvents of various kinds are employed for glues, varnishes and paints used in the woodworking industry. Highly toxic solvents such as benzene, tetrachlorethane or carbon tetrachloride are, at present, almost completely abandoned. Those more currently used are alcools, ethers, glycol derivatives, esters, chetones, turpentine. They have quite often an irritant effect on the mucous membrane and skin which may give rise to contact dermatitis and to localised skin alterations: the skin becomes cracked, chapped and vulnerable to other irritants and sensitizers. Certain solvents may cause allergic reactions and eczematous skins lesion.

Workers handling toxic chemicals in wood preservation and processing should be well instructed about the hazards and the means of protection. Furthermore, they should be provided with adequate washing facilities, specific decontaminants and anti-toxic emergency treatment facilities. Besides this, regular medical supervision of exposed workers is required. Continuing efforts are required to substitute highly dangerous chemicals by other less harmful ones.

2.2.3 Bursitis (beat elbow, beat hand, beat knee) and tenosynovitis (inflammation of tendons)

Bursitis is an inflammatory condition affecting in particular the elbow and knee joints. It is usually caused by repeated pressure or by repeated jolts to the joint in question. A particular form is the bursitis of the shoulder effecting woodworkers as a result of carrying heavy lumber or timbers.

Tenosynovitis is due to swelling of the tendon or the surrounding tissues due to rapid, repetitive movements. The most common form encountered in industry is a tenosnovitis of the hand, wrist or forearm, with important reduction of the mobility of the fingers and the hand, whose movements become very painful. The occurence of this disease is caused by unsuitable hand tools, painful work posture, jerky work movements instead of smooth working action, intense repetitive work after a period of rest, etc.

Prevention of bursitis and tenosynovitis can be achieved to a large degree by ergonomic adjustments of tools, improved design of machines and better working habits.

2.2.4 Noise and vibration

All woodworking machinery with high-speed cutting tools, such as saws, planers, spindle-moulders, etc. produce a considerable amount of high-pitched noise. The intensity and the spectrum, of this noise vary from one machine to another, but in general, when several machines are in operation, the noise level of the working environment is considerably high. The level of noise may vary, due to the non-continuous operation of certain machines, for instance, the intake of waste in chippers, pneumatic transport systems, etc.

Noise may have general and local effects on man. The general effects depend, in part on the individual degree of tolerance and may consist in nervous fatigue, lowering of the level of attention, gastric troubles, etc. However, the most common and important consequence of a prolonged exposure to noise is hearing impairment. The raising of the level of excitement of the sensory cells in the inner ear, and therefore a certain degree of hearing loss, is reversible within a limited period of time and initially this impairment recovers after a few hours of removal from the noisy environment. This is true for a number of years, usually ten or more, depending on the type of exposure and the spectrum of the noise. The hearing capacity of the worker is normal in the morning and during the weekend, but on work days slightly impaired at night. After a certain number of years, however, the time of recovery progressively grows longer and finally the lesions of the sensory cells become permanent and the hearing loss is no longer reversible. The hearing impairment is particularly severe in the higher frequency range of

sound i.e. between 3,000 and 6,000 Hz. The clinical characteristic of the occupational deafness is to be bilateral and to show in the audiogram a typical dip at the frequency of 4,000 Hz. Workers do not usually become aware of the progression of their deafness until the loss of hearing acuity reaches the spectrum of 500 to 2,000 Hz, which comprise the usual frequencies for verbal communciation. At that stage, the worker is frequently unable to distinguish certain consonants with high frequency components, such as 'f' or 's', and may be unable to make out words even though the sound can be heard.

The only effective prevention of this occupational disease lies in reducing the noise level and is therefore technical. It depends on the appropriate conception and design of machinery, as well as on regular maintenance. Cutting tools should be ekpt well sharpened and correctly balanced on their spindles and the machines should be fixed on a vibration-dampening base to minimise the amount of noise generated. Progress has been made in noise reduction by modifying cutting tools, by providing machines and machine tools with enclosures lined with sound-dampening material, by placing workers in noise-protected cabins and by the use of ear protectors.

At present, in a number of countries, maximum permissible levels of noise have been established. The application of these rules requires the carrying out of regular monitoring of the working environment with well calibrated noise level meters. Also, certain countries have prescribed pre-employment and periodical medical examination for workers exposed to excessive noise, with audiometric testing and have recognised hearing impairment due to noisy working environment as a compensable occupational disease.

Vibration transmitted to the hands and arms or whole-body vibration may constitute another occupational health risk caused by machines. Prolonged exposure to vibration is tiring and may affect the nervous and the musculoskeletal system. Generally speaking, in the wood industries vibration hazards do not appear to be pronounced. Within the statistical survey in part 1.3 of this paper occupational injuries caused by vibration have only been observed in isolated cases. In special circumstances vibration may reach dangerous levels resulting from defetive machines or machine installation or from inadequate maintenance. Special mention must be made of chain saws which

may cause the vibration induced with finger disease if used intensively over longer periods of time without being fitted with effective shock-absorbing handles. The white finger disease is prevalent among loggering workers in cold climates and may only exceptionally occur in the wood industries.

Further information on the protection of workers against noise and vibration in the working environment will be found in a special ILO code of practice issued in 1977.

2.3 Ergonomics

Ergonomics comprises primarily the adaptation of the working environment to the physiological and psychological capabilities of the worker and the prevention of stress and fatigue including health aspects of work organisation. The aim of ergonomics is to maximise the productivity of the worker whilst at the same time protecting his safety and health, as well as providing for his satisfaction and fulfilment in performing the work in line with the economic resources available for achieving an appropriate job design.

Ergonomic studies in the wood and wood-processing industries have been carried out during the past decade primarily in Sweden and Finland where technology is advanced and attention paid to working conditions is high. Surprisingly, these studies showed that a large number of workers complained of physically heavy work, of uncomfortable working postures of poor lighting and of an unfavourable working climate as regards cold in winter, heat in summer and excessive draught. In highly mechanised plants, short cycle tasks performed at paced tempo and high working speed created a considerable mental workload and social isolation. Shift work was another inconvenience. To this must be added complaints about noise, dust and fumes. For further information the proceedings of the IUFRO meeting on Ergonomics in Sawmills and Woodworking Industries may be consulted (published by Arbetarskyddstyrelse, Stockholm, 1975).

The studies indicated that there is ample scope for improvements and resulted in the discussion and implementation of practical measures to upgrade the working environment consisting among other things of drawing up guide-lines for the design of a sawmill corresponding as closely as possible

to ergonomic requirements. Particular attention was paid to overcome mental stress and social isolation by completely restructuring the work organisation in order to make the job more meaningful and responsible. This can be achieved by flexible work schedules and job rotation, but requires better trained polyvalent workers. Where such conditions can be created they will doubtlessly lead to a higher level of productivity and job satisfaction and significantly improve the occupational safety and health situation.

In developing countries the scope to apply ergonomic recommendations of this nature may be limited because of the generally prevailing simpler technology, economic limitations and lack of skills. However, even in the absence of relevant studies, there is every reason to assume that basic ergonomic requirements are overlooked almost everywhere.

In many woodworking plants in the developing countries, a large number of jobs are concerned with physically heavy work which is frequently done by workers in a poor state of health and nutrition, under unfavourable climatic conditions. The result is low productivity, many accidents and high rates of absenteeism and turn-over of labour. Improvements are required in two respects: on the one hand a minimum of general health care, adequate nutrition, supply of safe drinking water and a reasonable pattern of breaks and rest periods is necessary. On the other hand the physical workload should be minimised to the largest possible extent especially as regards manual loading, unloading and transport. Better work organisation plays a crucial role in this respect. To some extent it will be possible to replace manual by mechanical handling but in many cases this will economically not be feasible. For this reason the greatest attention must be given to improvement of manual handling by providing efficient helping tools such as turning hooks, levers, manual winches, by using wheel barrows, manual carts with rubber tires, manually operated rail systems, by making use of inclined planes and the like. In this context, attention should be paid to the maximum permissable weight to be carried by one worker as specified in the ILO convention No 127 and recommendation No 128 (1967). Straight-back lifting techniques are also important to reduce the high incidence of strained backs and hernias.

Shape of tools, work place, layout and operation of machines should allow comfortable work posture. Where possible, the worker should be seated instead

of standing during work. Visibility is frequently totally insufficient leading to fatigue, inaccurate work and accidents. Better lighting may be possible by means of simple adjustments. When building new plants adequate standards of visibility should be observed. In hot and humid climates work places should be ventilated to reduce the heat stress which considerably impairs the capacity for work.

A good means of adjusting jobs to basic ergonomic requirements is the checking of tools, machines or work places by means of ergonomic check lists, dealing in a detailed manner for instance, with the seat of the machine operator, instruments, controls, visibility, influences detrimental to health, physical and mental workload, safety, maintenance and repair, instruction of operator.

An example is given below of questions relating to the operator's seat:

1. Is the seat conveniently placed?
2. Can the seat be turned around if necessary?
3. Is there a back rest and is it appropriate?
4. Is the seat spring suspended, is it shock-absorbing, and is the spring-suspension adjustable?
5. Are the depth, width, height and inclination of the seat adquate?
6. Are positions of seat and back rest adjustable and can they be locked?
7. Are seat and back rest adequately shaped?
8. Is padding of seat and back rest adequate?
9. If required, are there conveniently located arm and foot rests?
10. Other important features.
11. Overall assessment.
12. Improvements recommended.

The questions of the check list may be answered by "favourable", "adequate" and "unfavourable". The ergonomic analysis should lead to a final overall assessment and to suggestions for improvements. To the extent possible, national or international standards or reference data should be considered. In the case of the seat for instance, dimensions should be appropriate to local anthroprometric data such as total height, sitting

height, length of arm, reach of arm, etc.

Ergonomic checking helps to ensure that work corresponds to the physical strength and size of the individual which varies in wide limits depending on sex, age and race. When tools and machines are transferred from industrial to developing countries they should be adjusted to the extent necessary to local ergonomic requirements.

Basic ergonomics is more a matter of common sense and practical judgement than of scientific study as can be seen when working with simple ergonomic check lists. For the same reason, it is an area where workers can easily be motivated to participate actively. This again is a field where a lot can be achieved with modest inputs. Furthermore, results of ergonomic improvements are often visible at once or after short delays.

2.4 General considerations on the prevention of occupational accidents and diseases

2.4.1 Organisation and responsibilities

At the country level the State, the employers' organisations and the trade unions should actively collaborate preferably by tripartite bodies in matters concerning industrial safety and health.

The competent State authorities will normally be responsible for establishing the relevant legislation and standards, for ensuring their enforcement and for providing training and research facilities.

The employers' duties comprise the provision and maintenance of a working environment corresponding to the existing safety and health legislation and standards. Large enterprises often establish additional regulations and special services, for instance for training. The employers must ensure that workers know and apply the necessary precautions.

Workers are required to watch out for hazards, to follow the safety instructions, to report unsafe conditions, to use properly guarded machines

and safer working techniques and to wear, as required, personal protective equipment.

In larger plants, safety specialists should assist management and workers in the prevention of occupational accidents and diseases. The safety specialist should regularly inspect all work places. Furthermore, safety committees should be established in which employers' and workers' representatives participate. Safety committees should meet at regular intervals and be involved in all safety matters.

Large plants should also maintain occupational health services for first aid treatment and emergency medical care, for pre-employment, periodical and special medical examinations, for the training of first aid personnel, for health education among workers and for monitoring activities designed to prevent occupational diseases.

Common occupational health services as well as common services of safety specialists may also be organised for a number of undertakings. In developing countries this has been done successfully, for example in the Sarawak Timber Industry Development Corporation which is running a joint accident prevention programme.

There are many instances where similar initiatives would appear feasible and desirable especially in countries where the State has not or not yet established special safety and health regulations for the wood industries and where the relevant inspection services are inadequate to cover the needs of this industry.

Difficulties of organising occupational safety and health activities exist in the small-scale and informal sector of the industry. In many developing countries the weakness of workers' organisations in the wood industries is another negative factor which makes it difficult to actively involve the work force. A solution to these problems may be found for the small enterprises in the context of co-operative organisations and for the work force by means of workers' education programmes with an adequate emphasis on health and safety.

2.4.2 Safety and health standards and regulations

Basic safety and health regulations are usually embodied in the general labour legislation. They may or may not include specific provisions for the wood and wood-processing industries. The former is generally the case in the industrialised countries where, in addition to legally enforcible provisions, supplementary voluntary rules and recommendations are commonly issued by the competent authorities, by accident insurance bodies, by the industry itself or by the individual enterprise.

It is particularly important to make sure that these rules and regulations are known to managers, supervisors and workers. To reach the worker level requires their transformation into richly illustrated leaflets written in simple language, the display of posters, the preparation of slide-shows with sound-tapes for the instruction of new workers or of workers transferred to operations new to them, etc.

In many developing countries special safety regulations for the wood and wood processing industry as a whole have not yet been officially issued. The standards applied may differ from enterprise to enterprise and range from high to completely inadequate. Basic safety rules are often not know to the worker or overlooked by the supervisor. Popular issues of safety regulations may be of little use if the worker is illiterate or does not understand the local language.

This illustrates some of the problems which the industry is presently facing and which can only be solved by a special and continuous effort preferably to be undertaken by the industry itself, requiring the establishment, the introduction and the supervision of adequate rules and regulations on occupational safety and health.

These efforts will be facilitated by adapting relevant regulations and materials of industrial countries to the prevailing local conditions. A good example in this respect is provided by an illustrated booklet on Safety in the Use of Woodworking Machinery which was issued in 1975 by the Directorate General Factory Advice Service and Labour Institutes in Bombay, India.

When purchasing new machines or establishing new wood industries the supplier of the machines should be requested to provide illustrated information on safety rules in the language spoken locally which may be used for the instruction of workers and supervisors and may be formally adopted by the enterprise.

2.4.3 Statistics, studies and research

It has already been discussed at some length that up until now very little is known about the specific problems of occupational safety and health in developing countries. In most cases, use is made of the relevant experience from industrial countries. However, it must alsays be observed that there are often substancial differences in respect of technology, education and training, culture and the physical conditions of workers.

For these reasons it is highly desirable to collect statistical information of occupational injuries as a basis for preventive activities corresponding as closely as possible to the requirements of the country or the enterprise. All accidents and occupational diseases should be reported to the competent authorities on a form which provides clear information on the injured person, the activity and the circumstances under which the injury occured. Electronic data processing permits at relatively little cost the treatment of this information. Large-scale enterprises should be in a position to make such arrangements at their own initiative or in collaboration with research institutions.

Such statistics should be particularly informative if a large number of injuries have been reported but never analysed. It may not be feasible or necessary to repeat statistical analysis annually but at intervals of a certain number of years they would be desirable to provide information about trends and about the result of preventive measures.

Additionally, it would be of interest in larger enterprises to establish a routine of systematically investigating on-the-spot every fatality and every injury leading to permanent, total or partial disability as soon as possible after it happened by carefully inspecting premises, tools, machines and

materials and by questioning other persons present and the responsible supervisor the purpose being to create working conditions under which such events will not reoccur.

When introducing new machines and technologies, initially little may be known of the potential hazards. In such situations critical incidence recording may help to find out in a relatively short period of time which precautions are essential. However, the application of the critical incidence method requires a qualified research worker and good collaboration with specially instructed workers and may therefore be feasible only under exceptional conditions.

2.4.4 Training

The best method of preventing occupational accidents and diseases is a properly instructed knowledgeable and skilled personnel. Considerations of ocupational safety and health should be an integral part of all general training programmes. In addition special training may be required in such matters. Training should be provided at all levels.

In developing countries these requirements are seldom met. Managers will normally be educated to deal with a wide range of managerial activities but may never have been systematically been introduced into occupational safety and health problems. Supervisors may tolerate unsafe conditions and acts because management does not care or they themselves are not knowledgeable in essential safety requirements. New workers may have been shown how to operate a machine by workers using unsafe working habits.

To change such a state of things is not easy and will in all likelihood fail if not tackled in the enterprise as a whole. A massive compaign of safety instruction and propaganda may be indicated for remedial action in addition to the establishment of a long-term training policy which pays full attention to occupational safety and health.

Adequate knowledge and skill is particularly required among the supervisors and foremen, machine operators, mechanics and electricians.

A special effort must also be made to see that the new entrants in the work force are adequately instructed before being employed on regular production work.

Training may be provided in industrial training centres, through special courses or on the job. The latter, however, is often an excuse for providing no or only inadequate training if not separated from normal production work and carried out by experienced instructors.

Special training is furthermore necessary for occupational health and safety specialists and for members of occupational safety and health committees. Where such training is not available for the wood industry, it may be shared with other industries.

Safety training and instruction needs to be an an ongoing concern and requires refresher and up-dating courses to keep in line with technological development and progress.

In this connection, the need for first aid training should also be mentioned, which is required for the whole workforce and which must also be repeated from time to time. First aid training may be incorporated into general vocational training courses, into special safety courses or may be provided separately. Care must be taken that the emphasis is placed on dealing primarily with those types of injuries that will most frequently occur and of using those first aid materials as will normally be available on the working site.

2.4.5 Work clothing and personal protective equipment

Work clothing should correspond to the climatic conditions and to the job requirements. Loose clothing is not admissable around woodworking machines. If workers do not have or cannot afford adequate work clothing, employers should assist in providing them with it.

When workers cannot be adequately protected against occupational hazards by other means, they should be provided with suitable personal protective equipment.

Work clothing and personal protective equipment provided by the employer should preferably be stored on the work site and be kept in proper conditions.

Workers employed at work places where there is a danger of head injury should wear safety helmets. In hot climates such helmets should be provided with ventilation holes, in cold climates with winter lining. Helmets are particularly important in log yards and building sites. Safety helmets are of little use if they are not properly adjusted to the size of the head, if they are not fitted with a solid cradle and if the air space between the cradle and the shell is less than 2.5 cm.

Eye protection by means of goggles or face shields is needed when the eye is exposed to injury from flying particles or dangerous substances, for instance when working with abrasive grinding wheels.

Hearing protection by means of ear wool, ear plugs or ear muffs should be used if the noise level is above 85 dB (A).

Aprons made of leather or other sturdy material provide protection in jobs where the worker is exposed to lacerations, splinters and kick-back.

To protect the hands, gloves may be advisable in certain work places. However, gloves should not be worn around woodworking machines if there is a danger of gloves being caught and dragged in by fast revolving machine parts. In such cases hand pads can afford protection against splinters.

Solid footwear with non-slip soles should be worn in all work places. As a protection against falling objects safety shoes with steel caps should be used especially at those work places where this danger is pronounced.

Respiratory protection is needed in work situations in which other means are insufficient to reduce exposure to airborne dust, fumes, vapours and gases below the permissable exposure limits. Special care is needed to ensure that respiratory equipment is regularly maintained, cleaned and kept in good condition.

When dangerous chemicals are handled rubber gloves, rubber aprons and rubber boots may be necessary for skin protection.

This list concerns only the most important items of personal protective equipment. Further ones may be needed for instance for workers in log ponds, for welders, for workers exposed to falls from heights, etc. Care must be taken to ensure that the possibilities for personal protection are used as much as is possible under the prevailing local conditions. This will only be feasible if workers are instructed and motivated accordingly and if employers make sure that the personal protective equipment provided by them is regularly used when necessary to prevent danger.
Mention must also be made of the necessity to provide first aid kits or boxes in suitable positions near work places, to ensure that their contents meets specified minimum requirements, that they are replenished after use and that they are regularly inspected.

2.5 International collaboration

A multitude of inter-regional and regional and of bilateral contacts have served and are continuing to serve the transfer to technology and the exchange of expertise and know-how in the wood and wood-processing industries. The developing countries are increasingly involved in these activities in which, to a certain extent, occupational safety and health requirements have been considered.

In collaboration with FAO and UNIDO the ILO has participated in such work in the context of technical co-operation projects dealing notably with woodworking and joinery. Furthermore, the ILO organised Tripartite Technical Meetings for the Woodworking Industry in 1967 and 1975 in which social problems of this industry were discussed including questions related specifically to occupational safety, health and welfare. The Tripartite Technical Meetings were concluded by adopting relevant Conclusions and Recommendations.

In the context of its international labour standard-setting activities, the ILO issued over the years some 160 Conventions and Recommendations of which

the following are of particular interest for developing countries as a model for the establishment of national regulations:

- ILO Convention No 119 and Recommendation No 118 (Guarding of Machinery - 1963),

- ILO Convention No 127 and Recommendation No 128 (Maximum permissable weight to be carried by one worker - 1967),

- Convention No 139 and Recommendation No 147 (Occupational Cancer, 1974),

- Convention No 148 and Recommendation No 156 (Working Environment - 1977),

- Convention No 155 and Recommendation No 164 (Safety and Health - 1981),

Furthermore, the ILO's Occupational Safety and Health Branch prepared the following publications which may be useful particularly for developing countries as a guide for specific measures in the woodworking industries:

- Model Code of Safety Regulations for Industrial Establishments (1949, rev. 1954),

- Report on Occupational Safety and Health and Welfare in the Woodworking Industries (1967),

- Code of Practice on Safety and Health in Forestry Work (1969),

- Occupational exposure limits for airborne toxic substances (1977),

- Code of Practice on Protection of Workers against Noise and Vibration in the Working Environment (1977),

- Code of Practice on Safe Design and Use of Chain Saws (1978),

- Code of Practice on Occupational Exposure to Airborne Substances Harmful to Health (1980),

- Report on Occupational Safety and Health Problems in the Timber (Logging) Industries (1981),

- Encyclopedia of occupational health and safety (1971, rev. 1983).

In addition to this, in the developing countries some 20 national institutions dealing with occupational safety and health and with ergonomics have been established or reinforced with ILO involvement. Most of these institutions are catering for all industries. Regrettably, however, technical co-operation related to occupational safety and health has never been focussed specifically on the wood and wood-processing industry of developing countries. It would therefore appear desirable to envisage doing this within the coming years in order to help finding solutions for the developing countries specific problems in this industry.

Appendix

Source of statistical information

Canada (Ontario)	1982 Statistical Book Forst Products Accident Prevention Association, North Bay, 1983
Canada (Quebec)	Statistiques sur les lésions professionnelles indemnisées, 1978 - 1979 Commision de la santé et de la sécurité du travail du travail du Québec, 1980
Federal Republic of Germany	1) Arbeitsunfallstatistik für die Praxis, 1983 Hauptverband der gewerblichen Berufsgenossenschaften, Bonn, 1982 2) Bericht 1975 - 1979 Holz-Berufsgenosenschaft, München, 1980 3) Erläuterungen des Unfallgeschehens Vertreterversammlung der Holz-Berufsgemossenschaft, Juni 1982
France	Statistiques nationales d'Accidents du Travail, année 1978 - 1979 - 1980 Caisse nationale de l'Assurance Maladie des Travailleurs salariés, Paris, 1982
Finland	Työtapaturmat 1979 Työsuojeluhallitus, Tampere 1980
Philippines	Work Accidents 81 Ministry of Labour and Employment,
Malasia (Sarawak)	Safety in the forest industry in Sarawak, FAO/Forestry Department Kuching, 1980
Sweden	Communication received from J. Carlsson, National Board of Occupational Safety and Health (Arbetarskyddstyrelse), May 1983
Switzerland	1) 5ème rapport annuel 1982 Office pour la sécurité du travail dans l'économie forestière, Soleure 2) Résultats de la statistique des accidents de la douzième période quinquennal 1973 - 1977 Caisse nationale suisse d'assurance en cas d'accidents, Luzern

United Kingdom

1) Health and Safety Statistics 1978 - 1979
Government Statistical Service

2) Furniture and Woodworking, Health and Safety 1977,
HM Factor Inspectorate, 1979

United States

Occupational Injuries and Illnessess in the United States by Industry, 1981
US Department of Labour, 1983

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Q U E S T I O N N A I R E

Occupational Safety and Health in the Wood and Wood Products Industries

	(please check appropriate box) yes	no
(1) Were the data contained in the study useful?	☐	☐
(2) Was the analysis sound?	☐	☐
(3) Was the information provided new?	☐	☐
(4) Did you agree with the conclusion?	☐	☐
(5) Did you find the recommendations sound?	☐	☐
(6) Were the format and style easy to read?	☐	☐
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